

Adoption of Cloud Computing Framework in Higher Education to Enhance Educational Process

Ayman E. Khedr, S. A. Kholeif, Shrouk H. Hessen

Abstract: Cloud Computing (CC) becomes the most promising technology to reach the advanced educational services, because it essentially provides a huge computing and storage capacities. Cloud computing provides reliable and tailored dynamic computing environments for education services. On the other side, e-learning has been realized as an efficient way of learning. The increasing number of students, services, education contents and resource as well as the way of adapting e-learning becomes problematic. As a potential technology to overcome the problems in e-learning, this study explores the potential impacts and the measure of how the educational services can be benefited by cloud. For that purpose the study attempt to adapt a proposed framework for virtual learning system in an extended cloud computing environment. This framework can be applied everywhere where there is a need for intensive teaching and learning in higher education. The applied case study findings of implementing the proposed framework equate the study expectations, where the student's satisfaction significantly increased compared with the existing system.

Keywords: Cloud computing, E-learning, New technology adaption process and E-learning based cloud.

I. INTRODUCTION

Cloud computing word is actually resulting from the way of the internet is often signified in network diagrams [24]. Cloud computing defines the feature given by computation resources through a computer network. As for the technique of computing, the users of computer hold all the important software and data to perform all computing operations on computation resources and files. Consequently, the users of cloud computing almost do not need to have any special background or skills for make computing on files except minimal operating system with browser and high speed Internet connectivity to access files and applications from online sources [25].

Cloud computing mainly aimed at running applications as services over the internet on a scalable infrastructure [3][5]. Many applications such as word processing, spreadsheets, presentations, databases and more can all be accessed from a web browser, while the software and files are hosted in the cloud.

Manuscript received March 26, 2015.

Dr. AymanElsayedKhedr, Associate Professor, Department of Information Systems, Faculty of Computers and Information, Helwan University, Cairo, Egypt.

Dr. SherifAbd ElkaderKholeif, Assistant Professor, Department of Information Systems, Faculty of Computers and Information, Helwan University, Cairo, Egypt.

ShroukHossamEldinHessen, IT Developer in Ismailia Court, Master Researcher in the department of Information Systems, Faculty of Computers and Information, Helwan University, Cairo, Egypt.

Educational institutions could have the advantage of cloud applications to provide students and faculty staff with less cost, extensive experience and productive tools [3]. However, CC has spread dramatically because of features which make it the target of most Cloud Service Providers (CSPs) but there is no comprehensible definition or standard

for cloud computing that all CSPs agree upon since each provider utilizes terminology based on its own product's portfolio [24].

The aim of this study is to structure e-learning based CC to cope with the problems in e-learning and to improve the existing Virtual Learning Environment (VLE) system align with a wide range of services that in turns to enhance the educational process and helping to improve the VLE environment to match the students' needs. The rest of this paper are organized as follows: section 2 gives a study background and briefly an overview of cloud computing, e-learning and the uncertainty factors surrounding the adoption process of new technologies. Section 3 presents the different literature view and related work related to the study in hand. Section 4 presents the proposed framework for e-learning based cloud whereas section 5 presents research methodology. Section 6 demonstrates the case study survey analysis and its related discussion. Finally, section 7 ends this paper with conclusion and future work.

II.BACKGROUND

One of the most important characteristics of CC is the scalability which is gained by the virtualization that the cloud builds upon [17]. Without having such virtualization, the cloud could not exist in its current shape with unlimited scalability by having the unlimited resources availability, flexibility, and elasticity which save a lot of configuration, updating, and maintenance effort [11][12][13]. Cloud computing is an extension of a paradigm where the capabilities of applications are exposed as services [3]. These services enable institutions that do not have the technical expertise to support their own infrastructure to get access to cloud computing on demand [23]. Educational institutions are beginning to have the advantage of existing applications hosted in cloud that enable their end users to perform tasks that have usually required site licensing, installation, and maintenance of individual software packages [3].

Eventually, from the point of implementation view; there are different factors affecting the successful adoption processes of a new technology. In the present research, these different factors are defined broadly as unpredictable and changeable variables/factors, the effects of which, on

the adoption process of cloud computing, cannot exactly be estimated (positively or negatively). These factors can be grouped into three homogeneous categories: external, internal and technology ambiguity factors. These various factors are supporting or obstructing the adoption of a new technology such as cloud computing in this study. Earlier studies investigated these factors in specific fields [26]. Most of these studies agreed on the following classification of uncertainty factors [26][16]:

A. External Factors: generally, these factors have effects on the introduction of a new technology to the different institutions (such as educational ones) and the adoption process related to it. There is a list of external factors to be considered, if referred to existing models of adoption, coupled with additional uncertainty factors that are relevant to the technology adoption process.

B. Internal Factors: these factors are classified into two common folds of factor categories; organizational factors, and personal attitudes or organizations employees' attitudes. Generally, literature approved that there is a positive relationship between the educational institutions' size and market share, and the technology adoption process.

C. Technological Factors: the uncertainty technological factors that affect the technology adoption process, most often studied in relatively stable environments and linked to technology acceptance, are response time, flexibility, usability or ease of use, and usefulness.

D- Learning Framework in Cloud Computing

Educational institutions, such as universities, neither need to put much effort about the construction of the environment of e-learning software and hardware nor invest enormous capital, human and material resources to construct the system. All those issues can be handed to service providers of e-learning cloud that especially customize for users. E-learning cloud environment provides large data center in which mass data storage, high-speed computation. Cloud computing platform provide resources services to teachers and students in the form of rental [20]. Cloud computing with virtualization is decreasing the expense of capital by increasing virtualization of the resources. This procedure removes operational expense by automating the requested service [17][22]. In addition, the cost reduction of using the cloud could save consuming time energy consumption, and effort in building infrastructure [27][4].

E. The Egyptian Public University's Problems

Nowadays universities need to customize their services according to their students' individual needs based on accurate analysis and understanding of available historical data. Egyptian university are faced with multiple problems most of which are related to this research issue. As for Egypt, Egypt is caused by all kind of unexpected changes on different levels (social, economic, technological and environmental) which, in its turn, caused various problems. These problems might be segmented and restated in three different folds [16], a) external educational institutions problems, b) internal educational institutions problems and c) technical educational institutions problems.

Accordingly, there is this a need to appropriate framework that has a better inclusive insight into the relationship

between the effective adoption process of CC and its effect on business value in higher education emphasis on e-learning based on cloud computing at Helwan University as a research case.

III. LITERATURE REVIEW

Cloud computing is a computing platform that offers computing power for researchers when they are exceeding institutions' local computing capabilities. CC has moved the user from being attached to a single machine to the internet [28]. Therefore, the user does not put much efforts of thinking about the file's physical location. Cloud Service Providers (CSPs) assure their runtime performance of individual applications by Quality of Service (QoS) [8]. These services can be categorized into three main service models. Each of services is considered a layer in the cloud, are as follows [20][23]:

A. Infrastructure as a Service (IaaS): in this layer, the whole IT infrastructure can be delivered as a service. The Cloud Service Providers (CSPs) offer different services, for example, computing power represented in the Virtual Machines (VMs), storage, networking services such as switches, routing services with load balancers, and workload capabilities.

B. Platform as a Service (PaaS): a virtual platform over the internet gives users the ability to develop and deploy their applications. Cloud Service Providers (CSPs) provide a set of tools to help the developers to build their applications easily by using any number of servers.

C. Software as a Service (SaaS): it is the simplest layer of this category; it simply means accessing an application through the internet on demand. In the SaaS layer, the CSP provides a single instance on the cloud for multiple users.

Cloud computing have four different types of cloud techniques that vary on their methods of deployment of computing [29][24]:

-Public Cloud: is a conventional way of cloud computing, where the vendors are supported by the IAAS, SAAS, and PAAS. In this methodology, the user can have the access to these services on an ad-hoc basis through the cloud such as EC2 and S3.

-Hybrid Cloud: it has both In-house and third part providers. In these kinds of clouds, some portions are private where it can be accessed only internal and the remaining portions are public which can be accessed externally.

-Private Cloud : it is an internal cloud which maintains and owns the services like PAAS, SAAS, and IAAS by the company. But still this cloud can be accessed by other cloud users through a private network. By this cloud, educational institutions have complete control of services, data security, applications and resources.

-Community Cloud: it is an external private cloud which is shared by many companies having the similar requirements.

E-Learning Based Cloud

Cloud computing is a technology that took shape by enhancing the existing e-learning technologies and methodologies. Cloud computing, mobile learning, communication technology, etc. are of help to bring the e-

learning to next generation of IT world [15]. E-learning environment is an environment which offers through e-learning applications to the students to get easy access of the materials and tools belongs to their studies. VLE and Personal Learning Environment (PLE) are two important E-learning environments which offer the wide range of facilities to students through the different e-learning applications [15].

There are a set of tools called Learning Management Systems (LMS) is typically utilized with e-learning and there are many types of LMS. Recently, researchers developed several investigations about the usability of e-learning in Egypt [2]. LMS is an e-learning platform which is considered as an important part of e-learning solutions from the university's viewpoint but LMS is software that automates the administration of training events. There are many techniques and their provider that provide the VLE such as Moodle and Learning Activity Management System (LAMS) [9]. E-learning based cloud is the sub division of cloud computing on educational field for e-learning systems [19]. Once the educational materials for e-learning systems are virtualized in cloud servers these materials are available for use to students and other educational businesses in the form of rent base from cloud vendors. E-Learning based cloud architecture is depicted in figure 1, and its content of five components are; Hardware resource, Software resource, Resource management, Service and Business application [19].

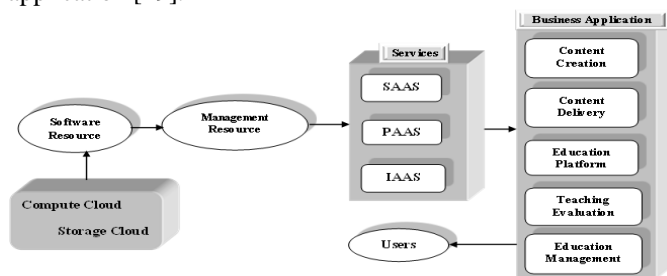


Fig. 1: Architecture of E-Learning based cloud
Source: Laisheng and Zhengxia, 2011

As for adoption framework perspective, there are the five main steps of e-learning based cloud framework. These five steps are developing the knowledge base about cloud computing, evaluating the present stage of the university, experimenting and choosing the cloud computing solutions, implementation and management of the cloud computing solution [21]. Meanwhile, there are three layers for building framework to apply e-learning based cloud could put into the consideration to reach us to the appropriate one for e-learning based cloud. These three layers are as follows [20]:

- i. The Base Layer:* it shares IT infrastructure resources and connects the huge platform that put them together to provide services. Cloud computing allows the hardware layer to be similar as the internet, to make the hardware resources shared and accessed as data resources in secure and scalable way.
- ii. The Platform Layer:* with the support of the powerful hardware, platform layer carries out the tasks of data storage, computing and software development, and achieving the tasks of completion of the original mass data

storage, business intelligence processing that have been difficult to complete.

iii. The Application Layer: e-learning cloud environment provides user-oriented ubiquitous adaptive hardware resources, computing environment and software services.

IV. PROPOSED FRAMEWORK FOR E-LEARNING BASED CLOUD

The research in hand presents a cloud computing based solution for VLE which combines a wide range of technologies and tools to create an interactive tool for enhancing the education process. So, the proposed framework allows the exchange of educational content and integrates different pedagogical approaches for learning and teaching under the same environment. The research model attempt to achieve the following objectives [3]:

- Estimating what the impact of cloud computing will be, this in turn requires knowing the facts about the capability of the educational institutions staff and the adoption processes.
- Identifying the needed changes that fit with the adoption process to gain the effective use of the cloud computing.
- For many educational institutions, cloud computing offers a cost-effective solution to the problem of how to provide services, data storage, and computing power due to the growing number of the Internet users without investing capital in physical machines, which need to be maintained and upgraded on-site.

The study framework focuses on how it could integrate VLE to use cloud techniques, private cloud and others service from public cloud. Using such a model supporting to avoid lock-in; likewise it gives us the ability to secure the educational institutions critical data and services by hosting them on the educational institutions' servers without having to give them to a third-party to be under control. By highlighting the how part, it might proceed to the details of the framework layers and architecture. Figure 2 shows the main components of the research proposed framework. These components are as follows:

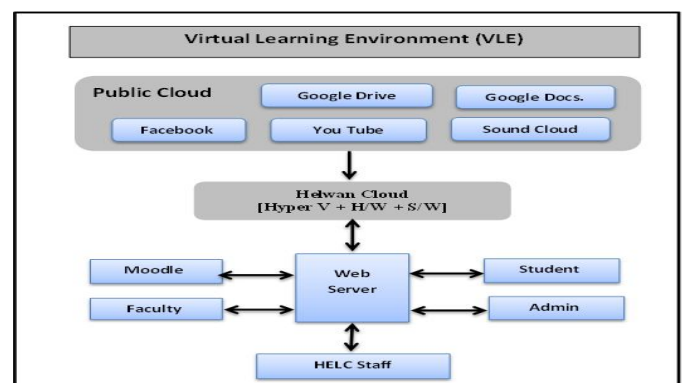


Fig. 2: Proposed framework for e-learning based cloud

- **Users:** they divided into "students and faculty" and represent the system users that have authorized access over all or part of the faculties' resources.
- **Web Server:** it contains the academic virtual learning system called Moodle also it contains the faculties

confidential data that requires more control and likewise need to be secured from the faculties, without having to give them to a third-party, cloud providers, to be under their control.

- **Cloud SaaS Layer:** it contains the public providers' services, as example "Google Docs", it's represent a range of tools for teaching and learning needed for classrooms. Google drive is used to give the students and faculty free storage space to put their data in and to share it with others.

V. RESEARCH METHODOLOGY

The research methodology of this study is considered Helwan University as a site of analysis. The units of analysis are Helwan E-Learning Center (HELC) and Helwan Scientific Computing Center (HSCC). Additionally, the study conducted three times surveys; the first time was planned as a pilot study survey, the second survey for measuring the general attitudes and opinions from two different views; students and centers staff, while as the third time for re-measure the general attitudes and opinions after the adoption of cloud computing.

The SERVQUAL instrument is adapted to measure service quality in two different times: first time was for measuring the services that provided by existing system offered by HELC to evaluate the students' satisfactions of e-learning in Helwan University in 2013/2014 and the second time was in most recently adoption process of cloud computing (Helwan Cloud for e-learning) to evaluate the students' satisfactions from current services offered this time by HSCC in 2014/2015 after the fully introduction of cloud computing in e-learning.

In 2013/2014, to evaluate the students' satisfactions in the Helwan University, the questionnaire measured the students' views by taking a sample from the Faculty of Computers and Information (FCI) and the faculty of Commerce and Business administration; Business Information System program (BIS). The validation of survey sample for the both faculties shows that there are 81.11% of students' views are valid and the remaining respondents (18.89%) are not valid for statistical analysis. Meanwhile, the validation of survey sample for FCI shows that there are 89.4% of students' survey is valid whereas remaining respondents 10.55% are not valid for statistical analysis.

Case Study: Survey Analysis for Current Situation

In the absence of empirical studies to assist in the selection of the most significant factors for the cloud computing adoption process in uncertain situation, all relevant factors have been identified and grouped together into three broad categories of internal, external and technological factors that influence the adoption process of CC in Helwan University. This will be taken up in the following survey analysis. The survey analysis presents the results of satisfaction level among students with the existing system. The survey shows that although the students get some benefits from the existing system services and facilities (16.71% for BIS and 25.42% for FCI) but they feel dissatisfied with the e-learning service offered by the HELC (48.61% for BIS and 32.48% for FCI). In the rest of this

subsection the findings of questionnaire survey will be illustrated and analyzed for both faculties (BIS and FCI).

A. Satisfaction Survey Analysis

As for BIS students' views, in general most of BIS students' sample based on their responds on satisfaction survey are dissatisfied (48.61%) with the overall services that are offered by HELC in terms of communication, speed of access, the ease of use, skillful, achieving tasks, accuracy, up-to-date, and the needed access time to students' data. As for FCI students' views, in general most of FCI students' sample according to their responds on satisfaction survey are dissatisfied (32.48%) with the overall services that are offered by HELC in terms of communication, speed of access, ease of use, skillful, achieving tasks, accuracy, up-to-date, and the needed access time to students' data. FCI students have not positive attitudes of the overall system services which have direct effect on their dissatisfaction feelings of using the existing system.

To conclude and in one hand, according to the findings of BIS and FCI students' satisfaction survey shows that most of the students are dissatisfied with the overall existing system services, the advancement system, and feel disregarded by HELC, generally. Moreover, they are fairly indifferent towards HELC's students. On the other side, the HELC staff agreed that the existing system is unable to provide the whole necessary students' data and information in a sufficient way. Based on the survey findings that illustrated above, the following two main conclusions can be drawn: 1) Students are dissatisfied with the existing service system and 2) HELC staff is indifferent opinions with the existing service level they offer to other faculties.

B. Awareness Survey Analysis

The findings show that the most of the BIS students (51.35%) are not aware by the services that have been supported by HELC. This highest ratio owing to that HELC does not provide the BIS students with the required information and knowledge of the way of usage and the functional ideas. The ratio of the FCI students (30.43%) is unaware by the services that provided by HELC. This is because of they do not believe that the usage of existing system could enhance the educational processes in their academic tasks and the interaction between them as well. These both attitudes result from the lack of information and knowledge of the system services that offered by HELC

C. Technical Survey Analysis

Generally most of BIS students respondents, agreed that their dissatisfaction (53.57%) of the services which provided by HELC due to technical obstacles and challenges. These obstacles are such as Internet speed and capacity in download lectures and for up loading their tasks and assignments. The FCI survey shows that most of the faculty students approved that their dissatisfaction (31.06%) of the services which provided by HELC as a result of technical problems. These problems also are such as Internet speed and capacity in download lectures and for up loading their tasks and assignments. In general attitudes, the students in both faculties are agreed that they do not gain any benefit of using it because of the technical problems which faced during the use of system.

D. Survey Analysis for Overall System Services

The findings approve that the most of BIS students use the services in bad condition (60.80%) with the overall system services that provided by HELC. This high percentage references to the technical problems and absences of VLE conceptual base of using e-learning to enhance their educational processes. On the other side, most of FCI students use system services in bad condition (36.16%) with the overall Moodle services that provided by HELC because of the technical problems too and the absences of adapting the conceptual base of VLE for usage e-learning to enhance the educational processes as well. The findings of questionnaire taking into consideration students and HELC staff views, which related to the expected benefits factor, can be summarized as follows:

VI.CASE SURVEY ANALYSIS AND FINDINGS DISCUSSION

The following figures and explanation show the sample result of the completed evaluation after the fully applying CC in the academic year 2014-2015. As for satisfaction level, figures 3 and 4 show the comparisons between the before and after opinion survey regarding the satisfaction level among the students sample in the different adapted features of Helwan cloud for e-learning. The whole percentages indicate that there is major increasing in the whole satisfaction levels for both students sample (BIS by 52.40% and FCI by 65.48%) in using the proposed system.

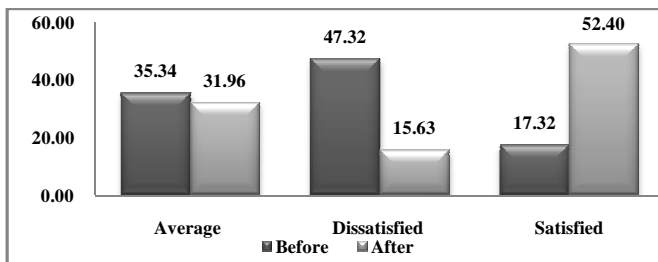


Fig. 3: BIS Students satisfaction levels

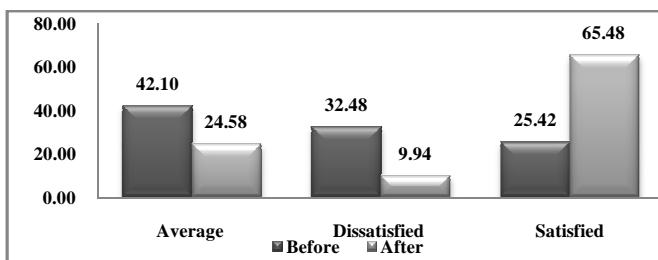


Fig. 4: FCI Students satisfaction levels

As for the awareness level measure, the comparisons show that there are a major increasing in the awareness level between faculties students (BIS by 50.71% and FCI by 68.53%), as depicted in figures 5 and 6. These high percentages indicate that the proposed system provides the students with the whole needed information and functions for using the new system which have directly positive reflect on their awareness level. In addition they strongly believe that the e-learning based cloud enhancing their educational processes in terms of achieving the academic tasks and increasing the interaction between them and with their instructors.

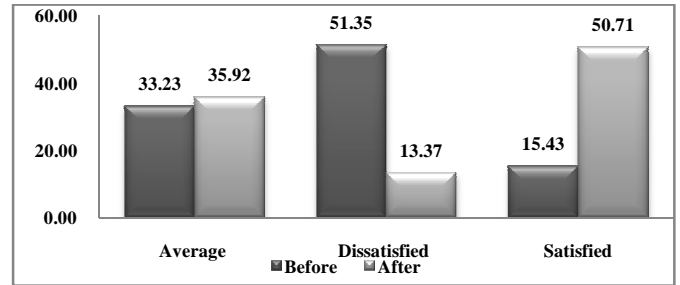


Fig. 5: BIS Students awareness

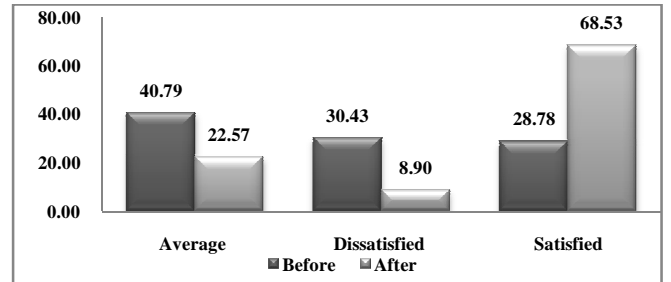


Fig. 6: FCI Students awareness

As for technical problems, generally most of BIS and FCI students respondents, agreed that their dissatisfaction in the early survey was due to the technical obstacles and challenges they faced in using existing system such as Internet speed and capacity in download lectures and for up loading their tasks and assignments. Whereas, figures 7 and 8 show that the students in both faculties, after the fully implementation of e-learning based cloud, are approved that they gain a various benefits of using the proposed system in terms of their academic processes without any technical problem could face them during the use of the proposed system (BIS by 52.14% and FCI by 64.60%).

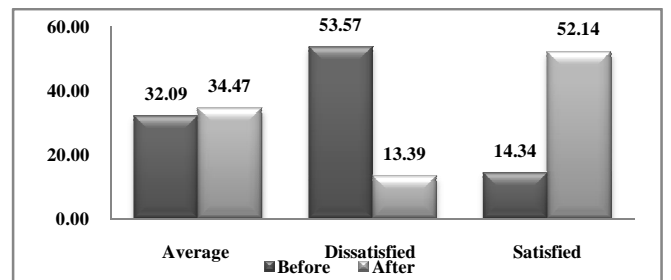


Fig. 7: BIS Students' views of technical problems

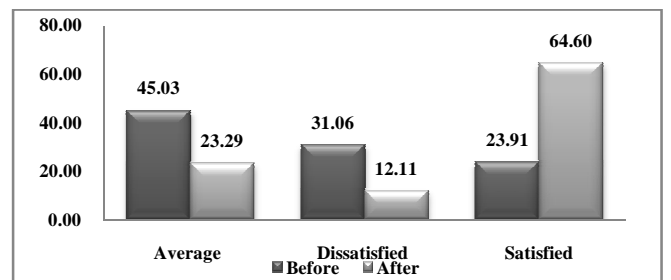


Fig. 8: FCI Students' views of technical problems

As for the findings analysis for overall system services, the findings approve that the most of BIS students use the services in good condition (53.92%) with the overall proposed system services. This high ratio references that the

introduction and the fully awareness of the proposed system in the way of enhancing their educational processes. On the other side, most of FCI students use system services in good condition (70.39%) with the overall proposed system services, as depicted in figures 9 and 10. Additionally, students are strongly agreed that the idea of using cloud for e-learning and the conceptual base of VLE for using e-learning enhanced their educational processes.

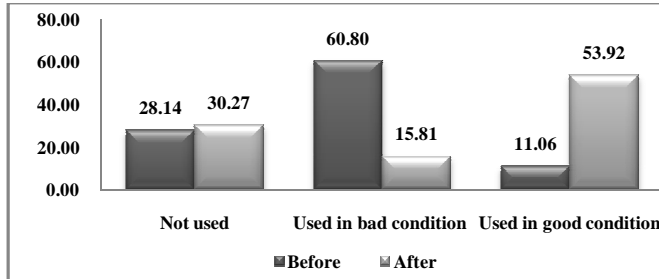


Fig. 9: BIS Students overall system services views

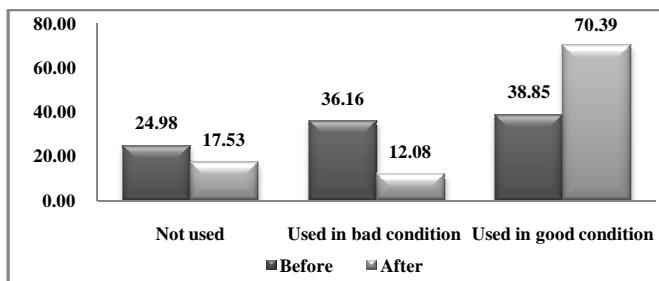


Fig. 10: FCI Students overall system services views

To conclude, the findings of implementing the adopted proposed system equate the study expectations; the findings show that there is a significant increasing in the whole level of survey in the comparisons of before and after implementation of the proposed system. So, it can be concluded that most of the study sample survey is satisfied of the whole proposed system provided by the adapted HSCC system align with HELC.

Generally, the results show that the HELC staff agrees that they might gain several benefits by applying the proposed technique. They list the benefits as follows: CC can help (1) reduce administrative/ transaction data costs, and (2) provide better information and knowledge about students to the center. Furthermore, the implementing of CC helps to keep existing students interested and to increase the students' satisfaction level. The results show that the HELC staff agrees that by applying the proposed technique (e-Learning based cloud computing) there are different benefits and settlements might be achieved, namely it can help to increase (1) the market share and enter new market, (2) the flexibility between HELC services and students, (3) HSCC ability to innovate, (4) convincing and encouraging the students for using HELC services and (5) increasing the HSCC staff knowledge skills of using it.

VII. CONCLUSION

The aim of this study is exploratory, building towards understanding and subsequently towards constructive guidance for the adoption process of new technologies in corporate environments. Since the research deals with poorly understood issues in a rich, difficult to control environment, caution ought to be taken in assessing the results. The study is attempting to apply a proposed cloud

framework for e-learning to enhance the educational process for Helwan University e-learning system. The findings of this research found that the number of students that use the existing system is low; as well the communication between the students and faculty members by mean of technology is likewise low and is not motivated by the actual facilities used by students and faculty in their daily life. The expectation of the study respondents compared to the real dealing does not match actual users' needs. The research used an experiment through the implementation of the new proposed system and used the sampling test thanks to it is a reliable tool to examine and measure the user satisfaction.

To conclude, the overall findings show that the educational process level is significantly increased toward both segments of the targeted sample. Therefore, it can be concluded that the implementation of the cloud computing for e-learning in higher education is expected to enhance the educational process via proposed system functionality besides matching the increasing needs of users and maximize the benefits that they gain through their online educational experience.

VIII. REFERENCES

- [1] B. Alexander, "Web 2.0 a new wave of innovation for teaching and learning", EDUCAUSE review,(2006), Available from: <http://www.educause.edu/ir/library/pdf/ERM0621>
- [2] A.Alshwaier, A.Youssef and A.Emam, "A new trend for E-learning in KSA using educational cloud", Advanced Computing: An International Journal (ACIJ),Vol.3,Jan. 2012, No.1, pp. 81-97.
- [3]M.Al-Zoube, "E-Learning on the Cloud", The International Arab Journal of e-Technology, Vol. 1, June 2009, No. 2, Princess Sumaya University for Technology, Jordan, pp.58-64.
- [4] D.Basak, R.Toshniwal, S.Maskalik and A.Sequeira, "Virtualizing networking and security in the Cloud", Newsletter ACM SIGOPS Operating Systems Review,Vol. 44,Dec. 2010, No. 4, ACM, New York, USA.
- [5] U.Bora and M.Ahmed, "E-Learning using Cloud Computing", International Journal of Science and Modern Engineering (IJISME), Vol. 1, Jan. 2013, Issue. 2, pp. 9-13.
- [6] K.Chine, "Learning Math and Statistics on the Cloud, Towards An EC2-Based Google Docs-Like Portal for Teaching / Learning Collaboratively with R and Scilab", Proc. of 2010 IEEE 10th International Conference on advanced learning technologies,July 2010 pp. 752 - 753.
- [7] J.Cubillo, S.Marten and M. Castro, "New Technologies Applied in the Educational Process", IEEE Global Engineering Education Conference (EDUCON), Learning Environments and Ecosystems in Engineering Education, Amman, Jordan, 2011, pp. 575-584.
- [8] F.Doelitzscher, A.Sulistio, C.Reich, H.Kuijs and D.Wolf, "Private Cloud for Collaboration and E-Learning Services: from IaaS to SaaS", Computing,Vol. 91,2011, pp. 23-42.
- [9]R.Doneva, D.Denev, G.Totkov,"On the didactic principles, models and E-learning", International Journal of Information Theories and Applications, 2007, pp. 1-8.
- [10] A.Gember and A.Akella, "Mobile Device Offloading Using Enterprise Network and Cloud Resources", 2010, Technical Report, University of Wisconsin Madison.
- [11] J.Idziorek, "Discrete Event Simulation Model for Analysis of Horizontal Scaling in the Cloud Computing Model", Winter Simulation Conference (WSC), Proceedings of the Dec. 5-8, 2010, Pp. 3004-3014.
- [12] P.Jadhvani, J.MacKinnon and M.Elrefai, "Cloud Computing Building a Framework for Successful Transition", GTSI Solutions, White Paper, Cloud Computing,2011, pp. 1-14.
- [13] R. Katz, P.Goldstein and R.Yanosky, "Cloud Computing in Higher Education", DUCAUSE review,2010, Available from: <http://net.educause.edu/sectionparams/conf/CCW10/highered.pdf>
- [14] G.Kaur and S.Chawla, "Cloud E Learning Application: Architecture and Framework", SSRG International Journal of Computer Science and Engineering (SSRG-IJCS), Vol. 1,June 2014, issue 4, India.
- [15] A. Khedr, "Towards Three Dimensional Analyses for Applying E-Learning Evaluation Model: The Case of E-Learning in Helwan

- University", International Journal of Computer Science Issues (IJCSI), Vol.9, July 2012, Issue: 4, No.1, pp.161-166
- [16] A.Khedr, "Adoption of new technologies in a highly uncertain environment: The case of Knowledge Discovery in Databases for Customer Relationship Management in Egyptian public banks", PhD. Dissertation LIACS, Leiden University, Leiden, The Netherlands, 2008.
- [17] D.Kondo, B.Javadi, P.Malecot, F.Cappello and D.Anderson, "Cost-Benefit Analysis of Cloud Computing Versus Desktop Grids", Parallel and Distributed Processing (IPDPS), IEEE International Symposium on 23-29 May 2009, Rome, pp. 1-12.
- [18] G.Kumar and A.Chelikani, "Analysis of security issues in cloud based E-learning", Master thesis in Informatics, School of Business and IT, University of BORAS, Sweden, 2011.
- [19] X.Laisheng and W.Zhengxia. (2011), "Cloud Computing: A New Business Paradigm for E-learning", IEEE, Pp. 716-719.
- [20] D.Madan, A.Pant, S.Kumar and A. Arora, "E-learning based on cloud computing", International Journal of Advanced Research in Computer Science and Software Engineering (IJARCSSE), Vol. 2, February 2012, Issue 2, pp. 1-6.
- [21] M.Mircea and A.Andreescu, "Using Cloud Computing in Higher Education: A Strategy to Improve Agility in the Current Financial Crisis", IBIMA Publishing Communications of the IBIMA, Vol. 2011, pp. 1-15, Available from: <http://www.ibimapublishing.com>
- [22] S.Nandi, B.Garrawal and A.Mantri, (2010, October) "Dynamic Higher Education and Research Cloud", at ASE 9th Global Colloquium on Engineering Education, Singapore.
- [23] M.Nasr and S.Ouf, "A Proposed Smart E-Learning System Using Cloud Computing Services: PAAS, IAAS and Web 3.0", International Journal of Emerging Technologies in Learning (IJET), Vol. 7, 2012 Issue 3, pp. 19-24, Available from: <http://dx.doi.org/10.3991/ijet.v7i3.2066>
- [24] P.Pocutilu. (2010). "Cloud Computing Benefits for e-Learning Solutions", *Oeconomics of Knowledge*, 2(1) pp. 9-14.
- [25] K.Popovic and Z.Hocenski, "Cloud computing security issues and challenge", In 2010 IEEE, pp. 344-349.
- [26] R.Premus, "Moving Technology from Labs to Market: A Policy Perspective", *Technology Transfer and Commercialization, Int.*, Vol. 1, 2002, No. 1/2, pp. 22-39.
- [27] G.Richards, R.McGreal and B.Stewart, (2010, December), "Cloud Computing, and Adult Literacy: How Cloud Computing Can Sustain the Promise of Adult Learning", A report on emerging technology for the alpha plus project, Cloud Computing and Adult Literacy, Available from: <http://auspace.athabascau.ca>.
- [28] Z.Yixin. (2010), 'A New Online Trading Platform Based on Cloud Computing', 2nd IITA International Conference on Geoscience and Remote Sensing, pp. 85-88.

Dr. AymanElsayedKhedris an associate professor of information systems, Department of Information Systems, Faculty of Computers and Information, Helwan University, Cairo, Egypt. His research interests include several filed such as Business intelligent, data mining, decision support system, cloud computing, and adoption of new technologies.

Dr. SherifAbd ElkaderKholeifis an assistant professor of information systems, Faculty of Computers and Information, Helwan University. His research interests include several fields such as Web application security, intelligent agents, and data mining.

ShroukHossamEldinHessenis an IT developer in Ismailia Court and a master researcher in the department of Information Systems, Faculty of Computers and Information, Helwan University, Cairo, Egypt. Her research interests are in Cloud computing, e-learning, adoption of new technologies, and big data.